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Forintek Canada Corp.

Project No.: 1948

Canadian Forest Service No. 21

Japan's Value Added Market: Wood Product Attributes and Competition

Attribute Analysis: Introduction and Methodology

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September 1998

Prepared for and with financial assistance from

Forest Renewal BC

and

Canadian Forest Service under the Contribution Agreement existing between the Government of Canada and Forintek Canada Corp.

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Acknowledgements

Forintek gratefully acknowledges Forest Renewal BC for partially funding this project. The authors would also like to acknowledge the Steering Committee and other industry contacts both in British Columbia and in Japan for this project.

This project was also financially supported by the Canadian Forest Service under the Contribution Agreement existing between the Government of Canada and Forintek Canada Corp.

The authors would also like to acknowledge Ms. Cheryl-lee Fast for all of her help in organising the market research survey material used in Japan.

All errors or omissions remain the responsibility of the authors.

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1 Introduction

The BC forest industry has traditionally focussed on producing primary products such as dimension lumber and pulp. Marketing efforts in Japan have demonstrated potential for increasing profitability through value-added production. These opportunities cannot be fully realized without appropriate market research. While product research is extremely important, it is of limited use if not backed by the marketplace, demonstrating the economic feasibility of moving down the value chain. Further, with the increased availability and interest in substitutes for BC wood products, it is the *attributes* of a wood product that are being demanded today, not necessarily a distinct product. To be competitive in new, value-added markets and to maintain competitiveness in existing markets, it must be determined what attributes are being demanded for specific end-uses and match these to those attributes that BC products can best provide. Once these attributes are identified, it is also essential that there be an understanding of who the global competitors are/will be for these opportunities.

The primary goal of this project is to identify value-added opportunities in Japan where BC wood products have the greatest potential for competitive advantage, sustainability of the resource, and maximizing the number of jobs created per tree. The project offers a powerful tool for secondary and primary producers in their development of product and market strategies, both for the short and the long terms. The project will also provide a common basis for the industry associations' promotional efforts. Finally, the project will provide a foundation to guide the government in trade (for example, facilitating market access), policy (for example, prioritizing silvicultural investments) and research.

The overall objective of this study is to compare wood product attributes demanded to those that can be profitably and competitively supplied to the Japanese market by the BC primary and secondary wood products sector. There are three phases to this project, all interlinked.

The first phase is covered in this report and addresses the attributes the Japanese market demands in both building products such as windows, doors, structural components and secondary manufactured wood products such as furniture and outdoor furnishings.

The second phase is a competitor examination using an international trade-flow analysis to highlight areas of competitive advantage for the BC value-added wood products sector. The initial development of this model is already complete and is titled Competitor Analysis 1. Forest Renewal BC received it August 1998. Competitor Analysis 2 will refine the model with input from this Attribute Analysis and is scheduled to be complete by the end of 1998.

The third phase is to use the expertise that resides at Forintek Canada Corp. to examine the attributes demanded by Japanese customers to determine which species of BC can supply what attributes. That is, given our resource which of these attributes can be supplied by BC producers. The trade-flow analysis will assist in determining who else could supply those attributes, that is the competition.

This report is organized to facilitate use by businesses as well as policy makers. The organization is covered in the next section.

2 Organization of Report

This report presents the results of the attribute analysis that was based on market research conducted in Japan from April – July 1998. It consists of six stand-alone sections, each one addressing a single product category. There will be a seventh section, offering a Summary, Discussion and Recommendations for Further Action in terms of product development, applied research and attractive niches for BC wood products. This will be prepared after the completion of the international trade-flow analysis and the work of Forintek scientists, representing complementary research that is being undertaken to link the present analyses with the competitive environment for BC wood products in Japan.

The titles of the reports with the types and number of people interviewed in brackets are as follows:

Attribute Analysis of Wood Furniture (50 designers and 130 consumers)
Attribute Analysis of Outdoor Furnishings and Decking (130 consumers)
Attribute Analysis of Interior Finish (85 small house builders, 50 designers and 130 consumers)
Attribute Analysis of Engineered Structural Products (85 small house builders and 130 pre-cutters)
Attribute Analysis of Wood Structural Members (85 small house builders and 130 pre-cutters)
Attribute Analysis of Building Systems (85 small house builders and 130 consumers)

3 Organization of Study

The first objective was to develop a methodology for identifying what wood product attributes are being demanded in Japan by end-use. To ensure maximum benefit industry expertise was incorporated into the specific design of all facets of this study including selection of products, their attributes, target audiences in Japan, translation accuracy, selection of market research firms in Japan and supervision of field data collection.

This objective was addressed by a) choosing wood product groups for investigation, defining key attributes and attribute levels for each product category, and identifying appropriate specifiers; and b) designing a "choice-based" survey methodology and instrument for attribute analysis in Japan. The definition of wood product groups/attributes/specifiers was directed by the steering committee. A conjoint market research technique was developed for the analysis, including the generation of all the Japanese material needed for implementation. Market researchers were interviewed in Japan, and two were chosen. Field data collection began by these firms in March, and was completed by the end of June. Analysis and the delivery of the final report is now complete.

The following table shows the make-up of the steering committee by their affiliation.

Table 1: Steering Committee

Ainsworth Lumber Company Limited
Riverside Forest Products Ltd.
Kootenay School of Art
West Fraser Timber
BC Wood Specialties
NFPA / SPF Working Group
Northwood Pulp and Timber
TimberWest Forest Ltd.
WRCLA
Weyerhaeuser Canada Ltd.
International Forest Products
Vancouver Island Ass. of Wood Processors
Canadian Forest Products
Slocan Forest Products Ltd.
CFLA / Zairai Promotion Group

The steering committee provided invaluable assistance in a variety of tasks:

- choosing appropriate wood products groupings, associated attributes, and appropriate attribute ranges,
- selecting which specifiers to target for each which product group
- narrow down the number of wood products groups, attributes and levels to a reasonable number,
- generation of appropriate survey questions shown in the appendix for each of the following six product reports, and
- assistance in ensuring meaningful translation into Japanese of all material

The project team consisted of Dr. C. Gaston, Forintek Canada Corp., Forest Products Market Economist and Dr. D. Cohen, Associate Professor, Department of Wood Science, University of BC.

4 Methodology of Attribute Analysis

4.1 The Conjoint Technique

The methodology developed in the project to determine the attributes demanded for selected wood product groups in Japan is a form of a "conjoint analysis". Conjoint analysis is a "choice-based" form of market research, where specifier respondents are asked to choose among a bundle of attributes repeatedly. The advantage is that the respondent is never asked a direct question about a product, such, as are they willing to use a Canadian SPF 2x4 in a particular application. Rather, products or product groups are defined as a bundle of attributes that define the product. *Conjoint analysis does not compare specific products or species, but the actual performance characteristics of the desired product group.*

Conjoint analysis is not a new technique, although it is rare to find published applications to the forest products industry. The technique is widely used in may consumer products industries such as automobile manufactures, soft drink companies, computer manufacturers, and so on. In each case, the industry has learned that consumers typically base their purchase decisions on three to five key attributes. For an automobile this may be a combination of price, the power package, status, and colour options. Obviously, the manufacturer is keenly interested in what these attributes are, their relative importance, and what attribute the respondent is willing to give up to get more of a second attribute.

To better understand how conjoint analysis works, a simple example is offered (adapted from Curry, *1996*).

Imagine a company that wants to market a new golf ball. After talking to a number of industry experts, the company determines that there are three important attributes of golf balls: average driving distance, average ball life, and price. Further research reveals feasible ranges for the first two attributes as follows, plus three existing market price categories:

Average Driving Distance	Average Ball Life	Price
275 yards	54 holes	$1.25
250 yards	36 holes	$1.50
225 yards	18 holes	$1.75

From the consumer's point of view, the ideal combination of these attributes would obviously be the best performance at the lowest price:

Consumer's Ideal Ball		
Average Driving Distance	**Average Ball Life**	**Price**
275 yards	54 holes	$1.25

Assuming that it costs less to produce a ball that travels a shorter distance and has a shorter use life, the ideal ball from a cost of manufacturing perspective would be the lowest performance ball at the highest possible price:

Manufacturer's Ideal Ball		
Average Driving Distance	**Average Ball Life**	**Price**
225 yards	18 holes	$1.75

Suppose that if the consumer's ideal ball is marketed, the sale price is below the cost of manufacture. If the manufacturer's ideal ball is marketed then no sales are made. The ideal market solution, then, lies somewhere in between. But where? This is what conjoint analysis can help us discover.

To illustrate, let's start by asking a consumer to rank each of average driving distance and average ball life. Done independently, the ranking would obviously be as follows:

RANK	Average Driving Distance	RANK	Average Ball Life
1	275 yards	1	54 holes
2	250 yards	2	36 holes
3	225 yards	3	18 holes

But what if these two attributes were considered "conjointly"? That is, what if we asked the consumer to rank the 9 possible combinations of these attributes (assuming price is the same for all combinations for the moment)? For example, "do you prefer a ball that has an average driving distance of 275 yards and lasts for 18 holes over one that has an average driving distance of only 225 yards but lasts for 54 holes?" Two possible ranks to repeating this question for all 9 possible combinations of these two attributes might be:

Buyer #1

	Average Ball Life		
Average Driving Distance	54 holes	36 holes	18 holes
275 yards	1	2	4
250 yards	3	5	7
225 yards	6	8	9

Buyer #2

Average Driving Distance	Average Ball Life		
	54 holes	36 holes	18 holes
275 yards	1	3	6
250 yards	2	5	8
225 yards	4	7	9

As can be seen by this example, both buyers agree on the most preferred (1 in upper left hand corner) and least preferred (9 in bottom right corner) ball. But in-between (the answer we are after for the "ideal" compromise between what the buyer and the seller want), the first buyer trades off ball life for distance, whereas the second buyer makes the opposite trade off.

Note that with this particular example, each of the driving distance and durability attributes would also be compared for trade-offs with the third attribute, price, again generating trade-off preferences.

It is easy to see from this simple illustration how much more information we are getting by asking the consumer to rank the attributes conjointly rather that the initial independent, rather obvious, ranking.

The next step in a conjoint analysis is to estimate the consumers' value assignments, or "utility". Through the collection of a high number of repeated choices among consumers between various combinations of the attributes, conjoint analysis yields a set of utility values such as the following:

Average Driving Distance		**Average Ball Life**		**Price**	
275 yards	**100**	54 holes	**50**	$1.25	**20**
250 yards	**60**	36 holes	**25**	$1.50	**5**
225 yards	**0**	18 holes	**0**	$1.75	**0**

Consider the following two feasible possibilities from the manufacture's point of view:

	Distance Ball	Long-life Ball
Distance	**275**	**250**
Life	**18**	**54**
Price	**$1.50**	**$1.75**

By assigning the utility levels for each of these attributes, the distance ball has a total utility of 105 (100+0+5), and the long-life ball 110 (60+50+0), suggesting a preference for the latter. This process can be repeated for all possible combinations of the three attributes, revealing overall preferences and even market segments (i.e. the "best" combination of attributes for those preferring a distance ball and the "best" for those preferring a long-life ball).

It is easy to see the value of obtaining these relative utilities. Conjoint analysis is very useful, for example in new product development. With utilities assigned to each identified attribute of importance, one is in a better position to design products that come closest to satisfying the customer. As conjoint analysis also shows the relative contributions of each attribute in the consumers' choice process, exploring the potential of product feature combinations that are not currently available can identify market opportunities.

To summarize, the analysis allows us to determine how important each attribute is, the utility level of each attribute, the utility of various combinations of attributes (i.e., product configuration), what product configuration generates the highest interest (utility), and how respondents vary in terms of their interest in new products (and how they might be segmented). Further, the analysis allows us to run preference simulations, yielding choices within the attribute levels. For example, if price is deemed an overwhelmingly important attribute, one might ask what other attributes a consumer is likely to give up in order to get a lower priced product.

Conjoint analysis is also a valuable tool for price sensitivity (as price can, and normally should, be a chosen attribute). For example, the analysis could be used to examine changes in the level of interest in your own product relative to a competitor's that result from changes in the price of your product.

4.2 Application of Conjoint to the Wood Products Market in Japan

There are numerous methodologies that can be employed in a conjoint analysis. In the present project, a "multiple choice" approach was chosen, which allows respondents to choose among three bundles of attributes at a time, rather than just two as shown in the previous section's golf ball illustration.

The first step in designing the conjoint survey instrument was to decide on the *products* to investigate, the determinate attributes of importance, the appropriate levels within each attribute, and the appropriate specifiers for each *product*, being the groups of individuals best qualified to represent demand.

To do this, the researchers brainstormed with steering committee members to define the wood products for investigation. It was decided to define a number of *product groups* (such as wood structural members) as opposed to individual products (such as Hem-Fir baby square). This choice was to maximize the use of the conjoint analysis for the process of ultimately matching attributes demanded to attributes, which BC can now or potentially supply.

Due to the diverse nature of the BC wood products industry, the steering committee was approached for the definition of product groups and associated *attributes* were broken into three sub-committees:

- those representing the BC Coast primary producers,
- those representing the BC Interior primary producers, and
- those representing the BC secondary wood products industry.

After individual meetings, roughly 15 product categories were generated, each with an identification of what the most important product group attributes would be and the appropriate specifier(s) for executing the conjoint survey. Due to the high costs associated with eventual implementation of the conjoint methodology in Japan, researchers then went back to the industry advisors for a ranking of their choices, bringing the total number of product groupings down to six. These six along with the target groups interviewed are shown in Table 2.

Table 2: Product Groups and Interview Groups

Product Group	**Types of People Interviewed**
Building systems	Small builders & consumers
Engineered structural products	Small builders & pre-cutters
Wood structural members	Small builders & pre-cutters
Interior finish	Small builders & designers & consumers
Wood furniture	Consumers & designers
Outdoor furnishings & decking	Consumers

With the product groups, attributes, attribute levels and specifiers defined, the next step was to create conjoint "choice based" surveys tables. This is the process of combining bundles of attributes for choice by the respondents. An example of this choice set-up is shown in Table 3 for building systems, with Japanese home builders being the specifier.

Note that this is only one set of choices among a great many possible combinations of attributes in the bundling process. In fact, the software package employed in this study generates 1,200 unique choice tables for each of the product group/specifier combinations.

To implement this choice based survey, the respondents within the identified specifier groups would be asked to *fairly quickly* chose either column 1, column 2, column 3, or none of the above (represented as column 4 in Figure 1). Note that the respondent is not asked to choose among individual attribute levels, rather a straight choice of one bundle of attributes over another. Any one respondent was asked to do this 20 times for a specific product group. Collectively over all respondents, however, these choices will be made thousands of times. The subsequent analysis, as discussed in the introduction to the conjoint technique, reveals individual attribute preferences, ranking, trade-offs among attributes (including price), and market share scenarios. Below is an example of the type of choice a respondent would make for building systems.

Respondents made 20 such selections for each of two product categories. In addition to the set of conjoint choice tables that respondents are asked to answer, it was deemed appropriate to add on a number of survey questions. This serves two functions: to collect demographic information on the respondent, and to gather both quantitative and qualitative information regarding the wood product groups that can supplement the information gathered in the conjoint survey. The appropriate survey questions for each product group are included in the appendices for each individual report from A-F.

Finally, to implement both the conjoint and question survey in the Japanese market, it was obviously necessary to translate the material into Japanese.

Table 3: Example Conjoint "Choice Matrix"

Example Choices for Building System			
1	2	3	4
♦ 2 story detached ♦ 5000,000¥ /tsubo ♦ wood from local retailer ♦ Japanese wood ♦ post and beam ♦ last 40 years	♦ 3 story detached ♦ 4000,000 ¥ /tsubo ♦ wood from local wholesaler ♦ Canadian wood ♦ hybrid ♦ last 20 years	♦ apartment ♦ 300,000 ¥ /tsubo ♦ wood from local retailer ♦ European wood ♦ 2 by 4 ♦ last 50 years	None of the choices are suitable

4.2.1 Product and Attributes

The following tables detail the final selection of specifiers, product groupings and associated attributes used in the creation of the "choice based" conjoint matrices for eventual implementation in Japan.

Furniture

Table 4: Product Attributes and Levels for Furniture for Designers and Consumers[1]

Price	***Colour***
inexpensive	very light
average expense	light
slightly above average expense	medium
above average expense	dark
Location in house	***Durability***
furniture for kitchen	lasts 2 years
furniture for living room	lasts 5 years
furniture for bedrooms	lasts 10 years
furniture for dining room	lasts 20 years
Finish	***Design style***
natural finish	fine European design
paint finish	Scandinavian design
laminate finish	traditional Japanese design
stain with clear finish	American (casual living) design

[1] Product attributes are in bold and levels for each attribute are indented.

Outdoor Furnishings and Decking

Table 5: Product Attributes and Levels for Outdoor Furnishings and Decking for Consumers[2]

Price	***Colour***
10 % less than current	*very light*
current prices	*light*
10% more	*medium*
20% more	*dark*
Maintenance	***Durability***
needs maintenance every 2 years	will last 5years
needs maintenance every 4 years	will last 10 years
needs maintenance every 7 years	will last 15 years
needs maintenance every 10 years	
Type of Wood	***Product Bundling***
Japanese Sugi	only 1 of decking, furniture & fencing
CCA (or other chemical)	only 2 of decking, furniture & fencing
Canadian Red Cedar	all 3 of decking furniture and fencing
US Redwood	complete co-ordinated outdoor system

[2] Product attributes are in bold and levels for each attribute are indented.

Interior Finish

Table 6: Product Attributes and Levels for Interior Finish for Builders, Designers and Consumers[3]

Price	***Durability***
10% less than current prices	replace every 10 years
current prices	replace every 15 years
10% more than current prices	replace every 20 years
20% more than current prices	*lasts as long as the house*
Colour	***Finish***
very light colour	no chemical finish
light colour	uses some chemical finish
medium colour	total chemical finish used
dark colour	
Location of wood use	***Material***
wood used for floor	solid hardwood
wood used in wall	solid softwood
wood used in ceiling	fibreboard core, veneer laminate
no wood feature used	fibreboard core with non-wood laminate

[3] Product attributes are in bold and levels for each attribute are indented.

Engineered Structural Products

For engineered structural products there was a difference between attributes for builders and pre-cutters. The supplier was considered an important attribute to measure for builders, with pre-cutters being one of these sources. For pre-cutters availability was the attribute used to replace supplier.

Table 7: Product Attributes and Levels for Engineered Structural Products for Builders[4]

Price	***Connections***
same as solid wood alternative	traditional connections with bracing
20% more than solid wood alternative	new steel connectors
40% more than solid wood alternative	*combination of traditional and steel*
60% or more than solid wood alternative	
Price stability	***Supplier***
stable for 1 year	local retailer
stable for 6 month	local wholesaler
stable for 3 month	local pre-cutter
changes with solid wood	large national supplier
	many different sources
Strength	***Source of wood***
meets minimum codes	European white wood
slightly stronger than code	Japanese wood
moderately stronger than code	Douglas fir
much stronger than code	Canadian Hemlock
	other offshore species

[4] Product attributes are in bold and levels for each attribute are indented.

Table 8: Product Attributes and Levels for Engineered Structural Products for Pre-cutters[5]

Price	***Connections***
same as solid wood alternative	traditional connections with bracing
20% more than solid wood alternative	new steel connectors
40% more than solid wood alternative	*combination of traditional and steel*
60% or more than solid wood alternative	
Price stability	***Availability***
stable for 1 year	all year
stable for 6 month	with 3 week delay
stable for 3 month	with 6 week delay
changes with solid wood	sporadically
Strength	***Source of wood***
meets minimum codes	European white wood
slightly stronger than code	Japanese wood
moderately stronger than code	Douglas fir
much stronger than code	Canadian Hemlock
	other offshore species

[5] Product attributes are in bold and levels for each attribute are indented.

Wood Structural Members

As with engineered structural products there is a difference between the attributes measured for builders and for pre-cutters. Builders had a distribution attribute category, replaced with sizes for pre-cutters.

Table 9: Product Attributes and Levels for Wood Structural Members for Builders[6]

Price	***Distribution***
10% less than current prices	local retailer
current prices	local wholesaler
10% more than current prices	local pre-cutter
20% more than current prices	national supplier
	many sources
Species	***Strength***
Hemlock	meets code
Scandinavian white wood	slightly stronger than code
Japanese sugi	much stronger than code
SPF	
Weight	
average	
light	
heavy	
variable	

[6] Product attributes are in bold and levels for each attribute are indented.

Table 10: Product Attributes and Levels for Wood Structural Members for Pre-cutters[7]

Price	***Sizes***
10% less than current prices	specified lengths, widths and depths
current prices	specified widths & depth
10% more than current prices	specified depth only
20% more than current prices	
Species	***Strength***
Hemlock	meets code
Scandinavian white wood	slightly stronger than code
Japanese sugi	much stronger than code
SPF	
Weight	
average	
light	
heavy	
variable	

[7] Product attributes are in bold and levels for each attribute are indented.

Building Systems

For building systems there were some differences between the attributes for Builders and Consumers. Distribution was considered an important attribute for builders while source of wood was considered important for consumers. The importance of the source of wood for builders was explored in the questionnaire that accompanied the conjoint analysis.

Table 11: Product Attributes and Levels for Building Systems for Consumers[8]

House type	***Construction Method***
2 story detached	Post and Beam (traditional)
3 story detached	2 by 4
connected row house	hybrid house (mix of P&B and 2 by 4)
apartment	
Price	***Durability***
300,000 Yen/tsubo9	house will last 20 years
400,000 Yen/tsubo	house will last 30 years
500,000 Yen/tsubo	house will last 40 years
600,000 Yen/tsubo	house will last 50 years
Source of Wood	***Strength***
Japanese wood	meets minimum building code
Canadian wood	slightly stronger than building code
European wood	stronger than building code
imported (not Canadian or EC)	much stronger than building code

[8] Product attributes are in bold and levels for each attribute are indented.

[9] a tsubo is a traditional unit of measure for Japanese houses based on the tatami mat and is equivalent to 3.3 m^2 or 33 ft^2

Table 12: Product Attributes and Levels for Building Systems for Builders[10]

House type	*Source of Wood*
2 story detached	Japanese wood
3 story detached	Canadian wood
connected row house	European wood
apartment	imported (not Canadian or EC)
Price	***Construction Method***
300,000 Yen/tsubo11	Post and Beam (traditional)
400,000 Yen/tsubo	2 by 4
500,000 Yen/tsubo	hybrid house (mix of P&B and 2 by 4)
600,000 Yen/tsubo	
Distribution	***Durability***
local retailer	house will last 20 years
wood from local wholesaler	house will last 30 years
wood from local pre-cutter	house will last 40 years
wood from national supplier or trading house	house will last 50 years
wood from many different sources	

4.3 Details of Analysis

The details and specifics of the analysis will not be covered in this report. The software used to both generate the conjoint matrixes and analyze the data was from Sawtooth Software Inc, in Washington State. The choice based conjoint module was used with the Paper and Pencil module enabling non-computer-based interviews. Only the information derived from the results are shown but statistical details are available upon request from the authors.

[10] Product attributes are in bold and levels for each attribute are indented.

[11] a tsubo is a traditional unit of measure for Japanese houses based on the tatami mat and is equivalent to 3.3 m^2 or 33 ft^2